

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings of claims in the application:

Claim 1 (Previously presented): An electrosurgical cutting system, comprising:

a) an electrically conductive blade, said blade having a first surface, a second surface opposite said first surface, and an edge where said first and second surfaces meet, said edge having an edge radius of curvature, wherein a predetermined length of said edge is a cutting portion for cutting biological tissue;

b) a first insulator on said first surface;

c) a second insulator on said second surface; and

d) a source of pulsed electrical energy electrically configured to connect to said blade, wherein said source of pulsed electrical energy is configured to apply a plurality of bursts of pulses separated by a burst interval of greater than about 1 ms during which no pulses are present and wherein the duration of the burst of pulses is 1 ms or less;

wherein said cutting portion has an in-plane radius of curvature that is at least 10 times larger than said edge radius of curvature along the entire length of said cutting portion.

Claim 2 (Original): The system of claim 1, wherein said edge radius of curvature is less than about 25 microns.

Claim 3 (Original): The system of claim 2, wherein said edge radius of curvature is less than about 10 microns.

Claim 4 (Original): The system of claim 3, wherein said edge radius of curvature is less than about 5 microns.

Claim 5 (Original): The system of claim 4, wherein said edge radius of

curvature is less than about 1 micron.

Claim 6 (Original): The system of claim 1, wherein along said cutting portion said first and second insulators each have a thickness less than said edge radius of curvature.

Claim 7 (Currently Amended): The system of claim [[6]] 1, wherein along said cutting portion said thickness decreases approximately linearly, within a tapering region, as said first and second surfaces approach said edge thereby to define a blade tapering angle.

Claim 8 (Original): The system of claim 7, wherein said blade tapering angle is less than 45 degrees.

Claim 9 (Original): The system of claim 8, wherein said blade tapering angle is less than 30 degrees.

Claim 10 (Original): The system of claim 9, wherein said blade tapering angle is less than 15 degrees.

Claim 11 (Previously Presented): The system of claim 7, wherein said pulses provided by said source are sufficient to vaporize and ionize a liquid medium present along said cutting portion thereby to form a vapor cavity encompassing said tapering region.

Claim 12 (Original): The system of claim 1, wherein said blade comprises Tungsten or Titanium.

Claim 13 (Previously Presented): The system of claim 1, wherein said source

of pulsed electrical energy provides pulsed electrical energy with each pulse having opposite electrical polarity to that of the previous pulse.

Claim 14 (Original): The system of claim 1, wherein said source of pulsed electrical energy provides pulses having a pulse duration between 10 ns and 10 μ s.

Claims 15-17 (Cancelled).

Claim 18 (Previously presented): The system of claim 1, wherein each of said bursts of pulses has a duration less than 0.1 ms.

Claim 19 (Previously Presented): The system of claim 1, wherein an energy of each pulse is such that a liquid adjacent to said cutting portion prior to application of the burst of pulses is vaporized.

Claim 20 (Original): The system of claim 19, wherein a total duration of said burst of pulses is between 5 μ s and 500 μ s.

Claim 21 (Original): The system of claim 20, wherein said total duration is between 10 μ s and 100 μ s.

Claim 22 (Previously Presented): The system of claim 19, wherein any two time-adjacent pulses in said burst of pulses have opposite electrical polarities.

Claim 23 (Previously Presented): The system of claim 1, wherein: said cutting portion is at least 50 μ m long; and a strength of an electric field caused by said pulsed electrical energy at said cutting portion varies by no more than 50% along the entire length of said cutting portion.

Claim 24 (Previously Presented): The system of claim 1, wherein said pulses from said source have a duration sufficiently long for generation of a streamer and spark discharge, and sufficiently short to avoid generation of a high current arc discharge.

Claim 25 (Previously Presented): The system of claim 1, wherein said blade is configured and wherein pulses from said source have a voltage such that a vapor cavity formed in a liquid medium adjacent said blade does not ionize until said vapor cavity extends to said first and second insulators.

Claim 26 (Previously Presented): The system of claim 1, wherein said blade and said first and second insulators are configured to be etched together during operation, whereby said edge radius of curvature remains substantially unchanged during operation.

Claim 27 (Original): The system of claim 1, wherein said blade is slidably mounted between said first and second insulators, whereby said blade can be extended to compensate for erosion of said blade during operation.

Claim 28 (Withdrawn): A method for pulsed uniform cutting of biological tissue along a cutting zone of an electrode while immersed in a liquid medium, the method comprising: a) delivering a burst of electrical pulses to said electrode to form a uniform vapor layer surrounding the cutting zone of the electrode, wherein a first vapor cavity forms in a high field region of said electrode, and wherein said electrical pulses do not ionize said first vapor cavity, and wherein said burst of electrical pulses then continues to vaporize said liquid medium in regions of lower electric field until said uniform vapor layer is completely formed along the whole cutting zone before said first vapor cavity collapses; and b) ionizing said uniform vapor layer resulting in uniform plasma-mediated discharge into said biological tissue contacting the vapor

layer.

Claim 29 (Withdrawn): The method of claim 28, wherein a total duration of said burst of pulses is less than 10 ms, whereby thermal damage to said tissue is reduced.

Claim 30 (Withdrawn): The method of claim 29, wherein said total duration of said burst of pulses is less than 1 ms.

Claim 31 (Withdrawn): The method of claim 30, wherein said total duration of said burst of pulses is less than 0.1 ms.

Claim 32 (Withdrawn): The method of claim 28, wherein said pulses have a pulse duration between 10 ns and 10 μ s.

Claim 33 (Withdrawn): The method of claim 28, wherein each pulse in said burst of pulses has opposite polarity than the previous pulse.

Claim 34 (Withdrawn): The method of claim 28, further comprising repetitively performing said delivering a burst of electrical pulses, wherein any two time-adjacent bursts are separated by a burst interval greater than 1 ms during which no pulses are present.

Claim 35 (Previously presented): An electrosurgical cutting system, comprising:
an electrically conductive blade having a first surface, a second surface opposite the first surface, and an edge where the first and second surfaces meet, wherein a predetermined length of the edge is a cutting portion for cutting biological tissue;
a first insulated region on said first surface;
a second insulated region on said second surface; and

a source of pulsed electrical energy electrically connected to said blade, wherein said source of pulsed electrical energy is configured to apply a plurality of bursts of pulses separated by a burst interval of greater than about 1 ms during which no pulses are present, and wherein the duration of the burst of pulses is 1 ms or less.

Claim 36 (Previously Presented): The system of claim 35, wherein the source of pulsed electrical energy is further configured to apply a plurality of bursts of pulses wherein the pulses are bi-phasic charge-balanced pulses.

Claim 37 (Previously Presented): The system of claim 35, wherein the source of pulsed electrical energy is further configured to apply a plurality of bursts of pulses wherein the pulses have a pulse duration between about 10 ns and 10 μ s.

Claim 38 (Previously Presented): The system of claim 35, wherein the source of pulsed electrical energy is further configured to apply a plurality of bursts of pulses wherein the pulses each have a duration between about 0.1 to 5 μ s.

Claim 39 (Canceled)

Claim 40 (Previously Presented): The system of claim 7, wherein said pulses provided by said source are sufficient to vaporize and ionize tissue present along said cutting portion thereby to form a vapor cavity encompassing said tapering region.